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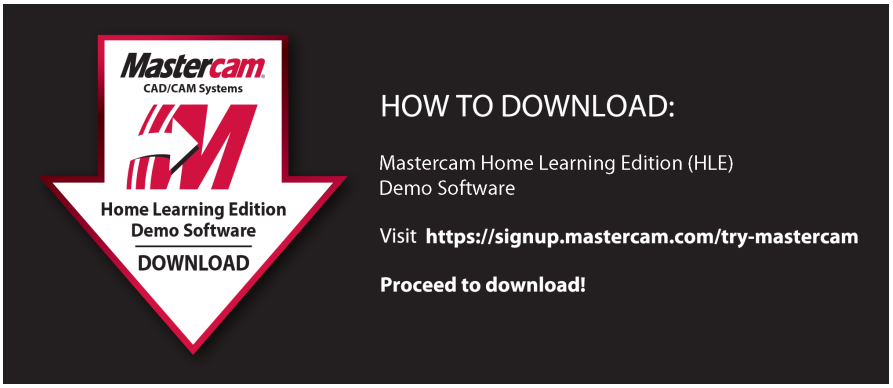

Mastercam 2022 Lathe Training Tutorial

Software: Mastercam 2022

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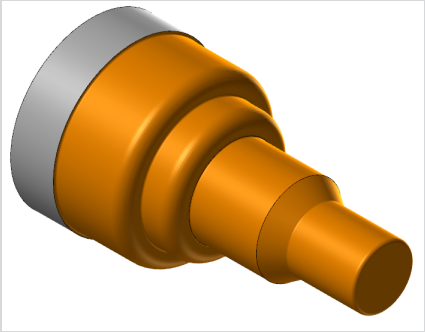
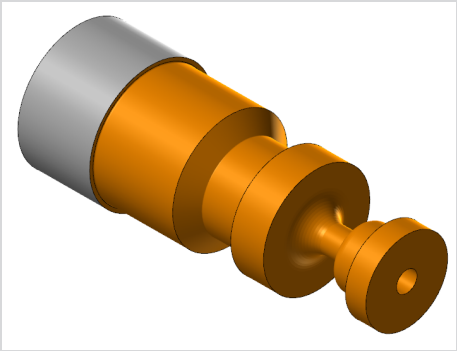
#1 	Rectangle Line Parallel Line Endpoints Fillet Entities Trim Entities	Face Roughing Finish
#2 	Rectangle Line Parallel Fillet Entities Divide Line Endpoints Trim 2 Entities	Face Roughing Finish Groove - Multiple Chains Drilling
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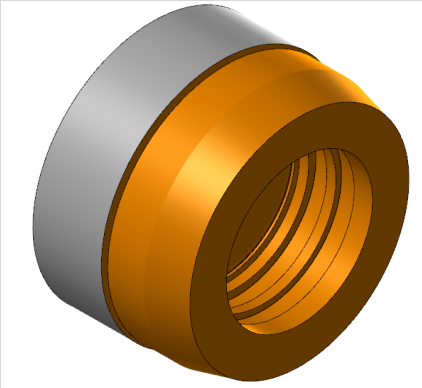
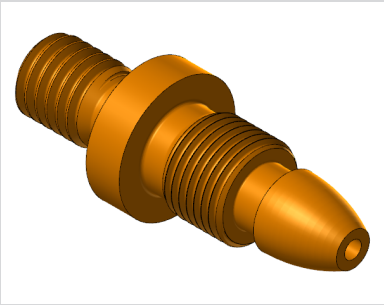
#4 	Rectangle Parallel Line Line Endpoints Trim Divide Trim 2 Entities	Face Rough OD Finish OD Drill Rough ID Finish ID Groove ID- Multiple Chains Cutoff
#5 	Line Endpoints Arc Tangent Dynamic Relief Groove Chamfer	Setup 1 Face Rough OD Finish OD Groove Thread Drill Stock Flip Setup 2 Face Rough OD Finish OD Groove Thread Drill
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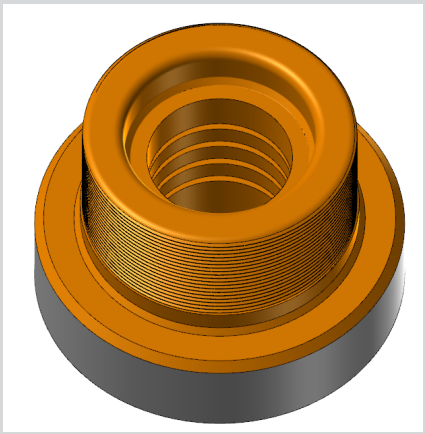
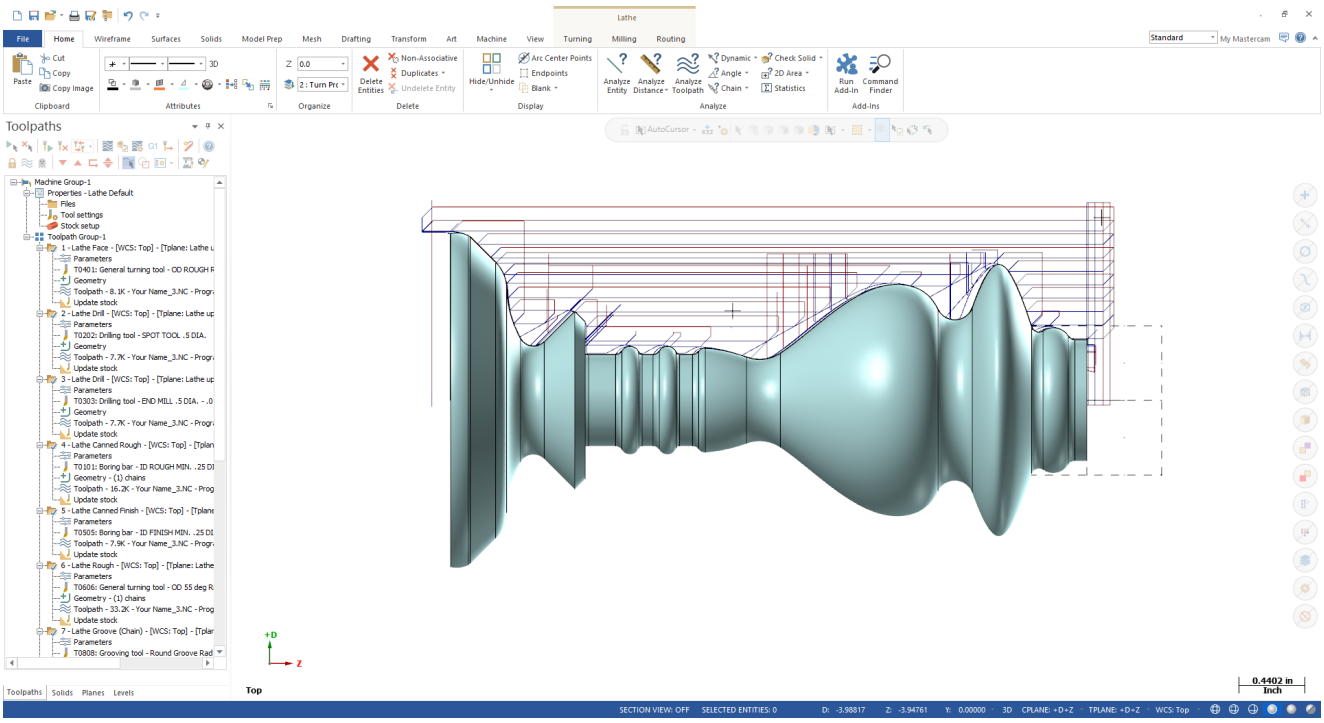
Tutorial	Geometry Functions	Toolpath Creation
#7 	**Import a SolidWorks File** **Levels** **Turn Profile**	**Create standard toolpaths geared towards VTL machines.** **Face** **Rough OD** **Finish OD** **Drill** **Rough ID** **Finish ID** **Groove ID** **Edit Tool** **Thread**

Getting Started



OBJECTIVES

- Starting Mastercam
- The student will learn about the Graphical User Interface.
- The student will learn how to navigate through Mastercam.
- The student will learn how to set the Attributes and use Managers.
- The student will learn how to set Mastercam Units.
- The student will learn how to set the Grid.

STEP 1: STARTING MASTERCAM

1.1 For Windows 7

- Select the **Start** button.
- Select **All Programs** and click on Mastercam 2022.

1.2 For Windows 8

Select the **Start** button.

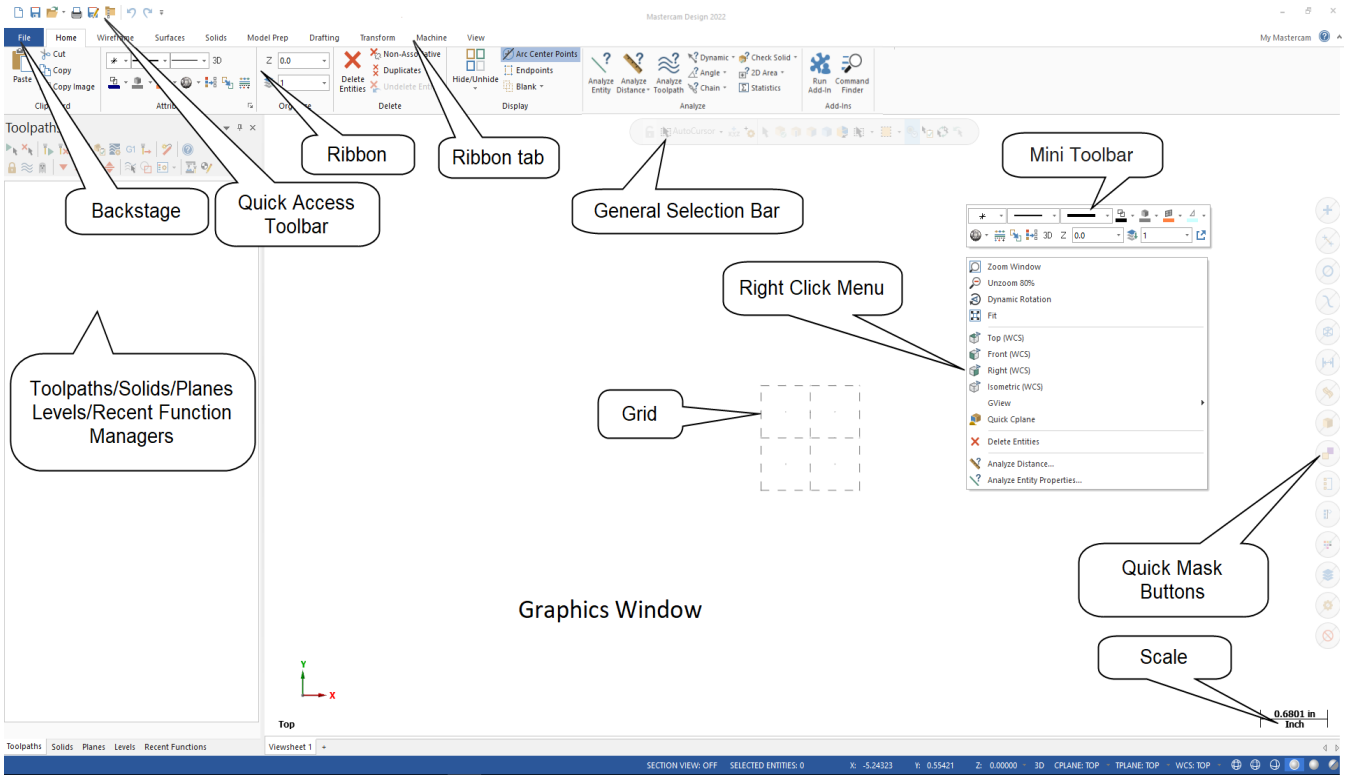
- Click on the drop down arrow to open Apps.
- Find and click on Mastercam 2022.

1.3 For Windows 10

- Select the **Start** button.
- Click on the drop down arrow to open Apps.
- Find and click on Mastercam 2022.

- To start the software, from **Desktop**, click on the shortcut icon as shown.

STEP 2: GUI - GRAPHICAL USER INTERFACE



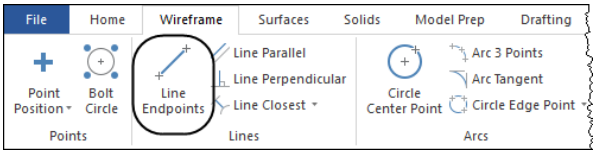
Quick Access Toolbar	**QAT** contains a fully customizable set of functions that can be quickly accessed by the user.
Backstage (FILE)	Allows you to manage files. You can insert information about files, start a new file, open an existing one or merge files together. You can also save, convert or print files as well as access the help resources.
Tabs	Contain all the functionality within Mastercam.
Ribbon	Displays the commands available for a selected Tab.
Selection Bar	Allows you to set the **AutoCursor** modes and to switch between wireframe or solid selections.
Quick Mask Buttons	Let you select all entities of a specific type. Clicking on the left side of the button or right side of the button toggles between select all or only.
Right Click Menu	Right click menu allows quick access to functions such as zoom, graphic views or recent functions used. A mini toolbar will also appear that allows you to quickly change the attributes.
Toolpaths/Solids/Planes Manager	Lists the history of the toolpath operations and solids.
Graphics Window	Workspace area in Mastercam where the geometry is displayed.
Scale	Shows you a scale of the object on the screen.
WCS: TOP T/Cplane:	Displays the current **WCS** and **T/Cplane** information.

STEP 3: NAVIGATE THROUGH MASTERCAM

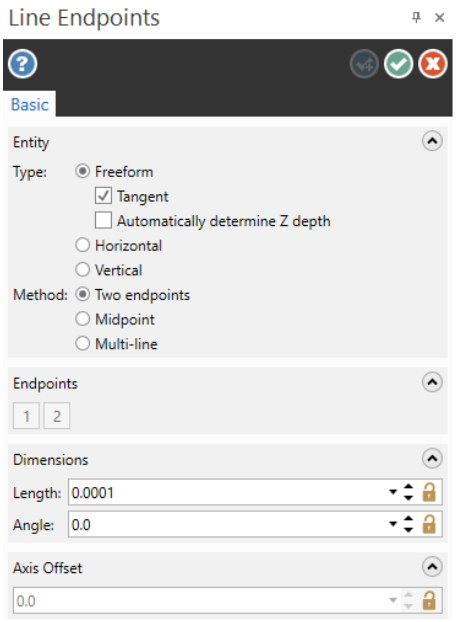
In this step, you will learn how to use the menu functions in Mastercam to create geometry.

3.1 Using the Wireframe tab to select the command to create Line Endpoints

- Left click on **Wireframe**.
- Left click on the **Line Endpoints** icon as shown.



- Once you select Line Endpoints, the Line Endpoints panel appears on the screen as shown.



Sketching a line

- To sketch a line, left click on two locations on the screen.

Creating a line knowing the endpoint coordinates

- To make a line knowing the two endpoint coordinates, select the **AutoCursor Fast Point** icon from the **General Selection** toolbar.

- In the coordinates field that opens in the upper left corner enter the coordinates of the first endpoint as shown.

- Press **Enter** to continue.
- Select the **AutoCursor Fast Point** icon again and enter in the coordinates of the second endpoint and then press **Enter**.

Creating a line knowing an endpoint, the length and the angle

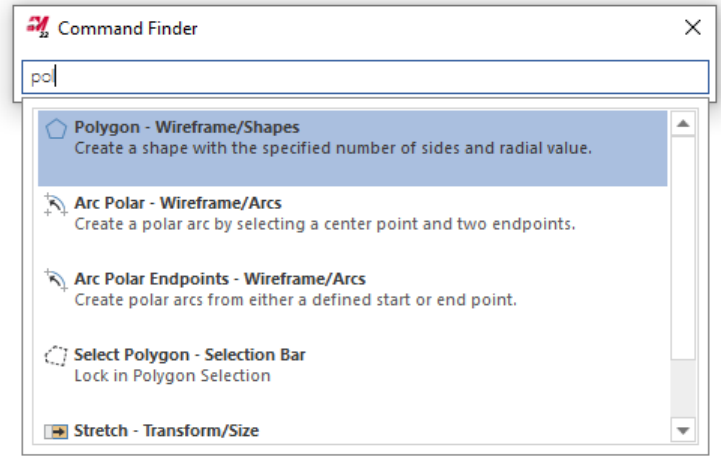
- You can also enter the coordinates of the first endpoint, then enter the **Length** and **Angle** if necessary.
- To continue making lines, choose the **OK** and **Create New Operation** button from the dialog box or press **Enter**.
- To exit the current command, select the **OK** button or press the **Esc** button.
- To undo the last command, from the **QAT** (**Q**uick **A**ccess **T**oolbar) select the **Undo** button. The Undo button can be used to go back to the beginning of geometry creation or to the last point of the saved file. Mastercam also has a **Redo** button for your convenience.

3.2 Function Prompt

Prompts the user to execute a command.

Example: this prompt is used in the **Line Endpoints** command. Specify the first endpoint

Note: To find a command, from the **Home** ribbon, select the **Command Finder** icon and type the function name in the field that opens up. For example, to find the **Polygon** command type "polygon" in the text field.From the list, select the desired command.



STEP 4: SET THE ATTRIBUTES

Mastercam attributes are point style, line style, line thickness, color and levels. Before starting to create geometry, you should set the attributes.

4.1 Attributes Group

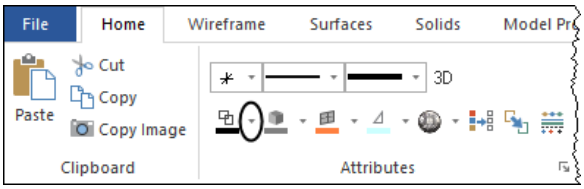
Point Style	Displays and sets the system's point style.
Line Style	Displays and sets the system's line style.
Line Width	Displays and sets the current system's line width.
Color	Assigns the current color to wireframe, solid and surface entities. To change the current color, click in the specific color field and select a color from the color pallet. To change an existing geometry color, select the geometry first and then click in the color field and select a color from the color pallet.
Clear Color	When performing a transform function (Xform), Mastercam creates a temporary group from the originals (red) and a result (purple) from the transformed entities. These system groups appear in the Groups dialog box. However, they stay in effect only until you use the Clear Colors function or perform another transform function.
2D / 3D Construction Mode	Toggles between 2D and 3D construction modes. In 2D mode, all geometry is created parallel to the current Cplane at the current system Z depth. In 3D mode, you can work freely in various Z depths, unconstrained by the current system Z depth and Cplane setting.

4.2 Organize Group

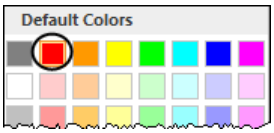
Z Depth	Sets the current construction depth. To set this, click the drop down arrow and pick one from the most recently used list or click the Z: label and pick a point in the graphics window to use the Z depth values based on the selected entity.
Level	Sets the main level you want to work with in the graphics window. To change the current working level. Type the level number in the box.

4.3 Change the Wireframe Color

- Click on the drop down arrow next to the **Wireframe Color** field as shown.



- Select the desired color from the dialog box as shown.

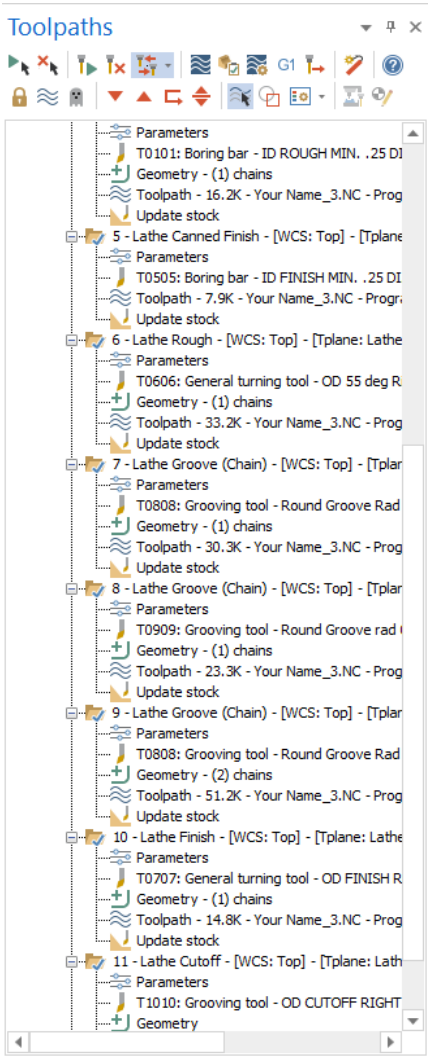


Note: Any geometry on your screen will remain in the previous system color. This change will only affect the geometry you create going forward.
To change the color of existing geometry, select the entities first and then click on the drop down arrow next to the Wireframe Color and select the desired color. The same method can be applied for any other attribute that you want to set or change.

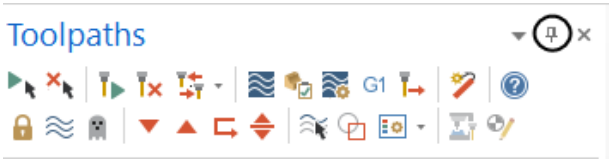
STEP 5: MANAGER PANELS

5.1 The Toolpaths Manager

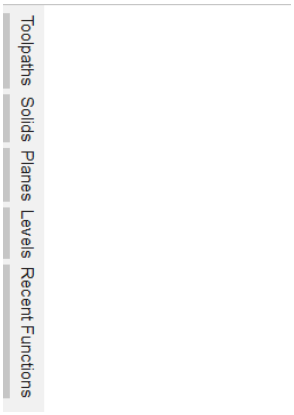
The **Toolpaths Manager** displays all the operations for the current part. You can sort, edit, regenerate, verify and post any operation as shown. For more information on the **Toolpaths Manager**, please click on the **Help** icon.



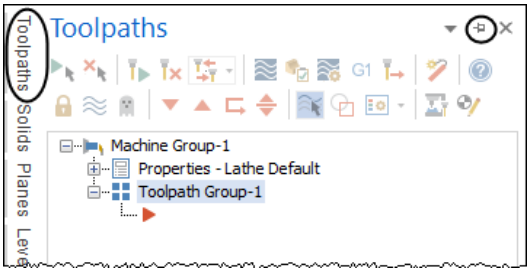
- The **Toolpaths Manager**, **Solids Manager**, or **Planes Manager** can be hidden to gain more space in the graphics area for creating geometry. Use **Auto Hide** icon to close all **Toolpaths**, **Solids**, **Planes** and **Levels Manager** panels.



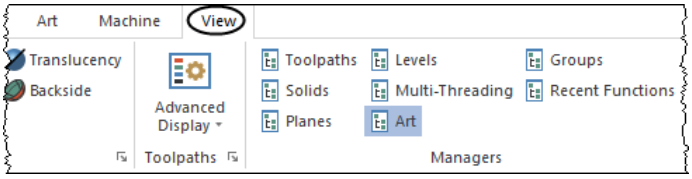
- The panels will be hidden to the left of the graphics window as shown.



- To un-hide them, click on one of the managers to open it and then click again on the Auto Hide icon a shown.



- Selecting the **X** (**Close** icon) instead of the **Auto Hide**, you will close the manager panel. To re-open them, from the **View** tab, select **Toolpaths**, **Solids**, **Planes** or **Levels** as shown.



STEP 6: SETTING MASTERCAM TO IMPERIAL

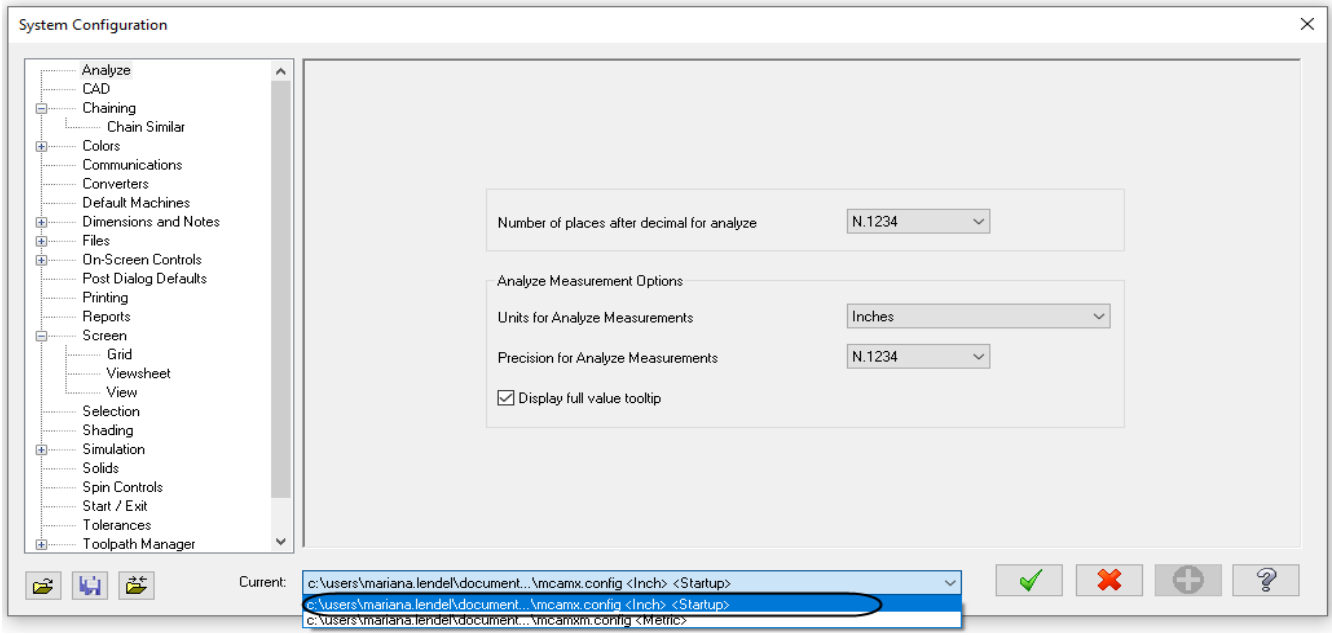
In this step you will learn how to set the imperial system as your default. You will have to select the Backstage options and select the system configuration.

6.1 Setting Mastercam to imperial for the current session only

Note: You may need to switch Mastercam to run in Imperial mode.

File

- **Configuration**.
- Select the drop down arrow beside **Current** as shown.
- Select **mcamxm.config <Inch>** as shown.

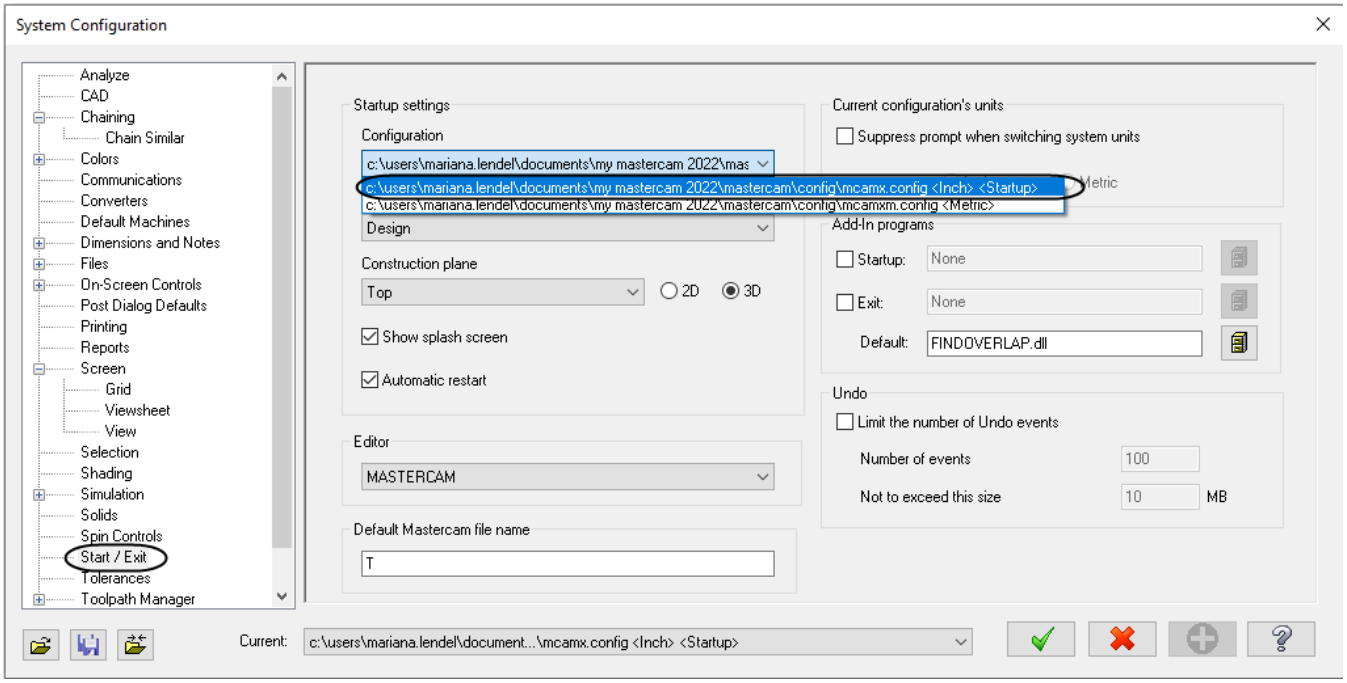


Note: If you have a metric drawing on the screen Mastercam may ask you to scale the current part to imperial. Choose Yes if you wish to do this.

6.2 Setting Mastercam to imperial as a default

Note: If you wish to always work in Imperial mode, follow these steps to save imperial as your current configuration file.

- Select **Start/Exit** from the configuration topics.
- Select the drop down arrow below **Configuration** in the **Startup** settings area as shown in.
- Select **mcamxm.config <Inch>** as shown.

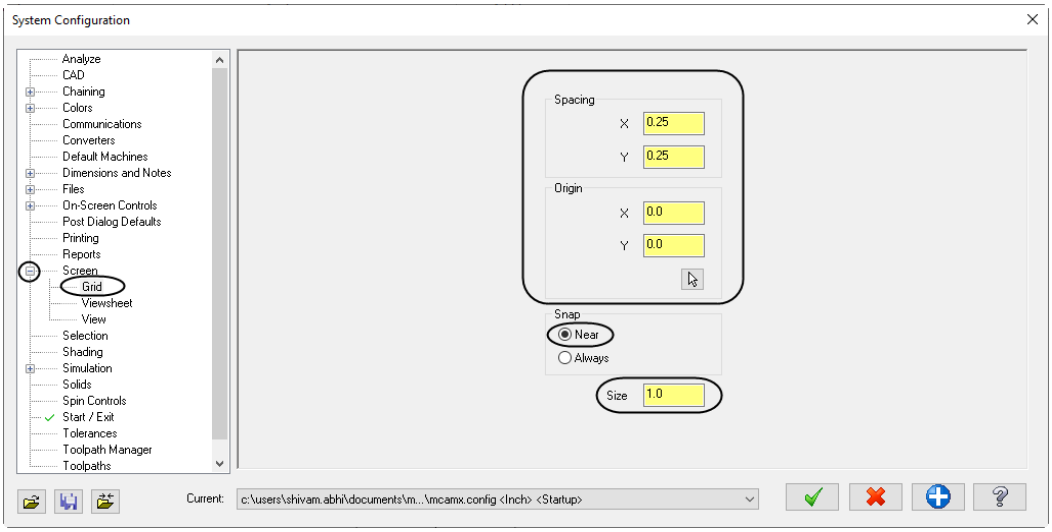


STEP 7: SET THE GRID

Before beginning to create geometry, it is highly recommended to enable the Grid. The grid will show you where the origin is and the orientation of the grid gives you a quick preview of the plane you are working in.

- Select **Screen** from the configuration **Topics**.

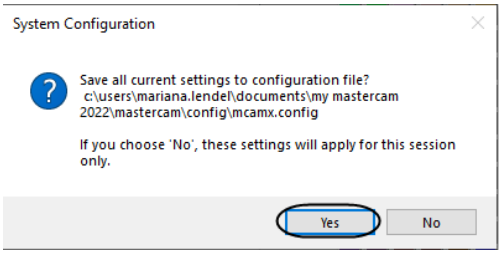
- Select the plus sign (**+**) beside **Screen** as shown.



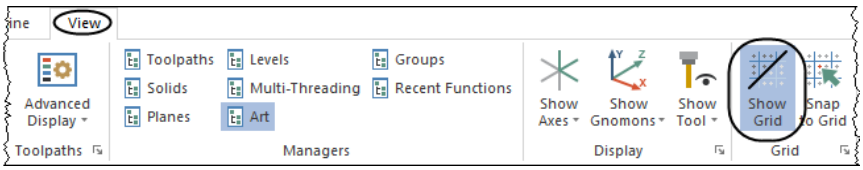
- In **Grid Settings**, change the **Spacing** to **X = 0.25** and **Y = 0.25**.
- Set the **Size** to **1.0**.

- Select the **OK** button to exit the **System Configuration** dialog box. 

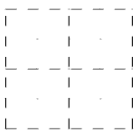
- Mastercam will then prompt you to save these settings to your current configuration file, select **Yes**.



- To see the **Grid** in the graphics window, from the **View** tab, enable **Show Grid** as shown.



- The grid should look as shown.



CONVENTIONS USED IN THIS BOOK:

We have attempted to make this manual as uncluttered as possible and provide you with reference information when it is appropriate. It is not intended to be a Reference Guide or all-encompassing user manual.

The text styles used are the followings:

Standard Text - Represents normal wording needed to provide you the instruction.

STEP 8: STEP TITLES

8.1 Sub step titles

Information about the current step or terms or parameter definitions describing the parameters and description.

Bold Text - Represents menu commands, dialog box settings or other similar items from the screen.

Note: Represents information about the process step that is important or may require an explanation.

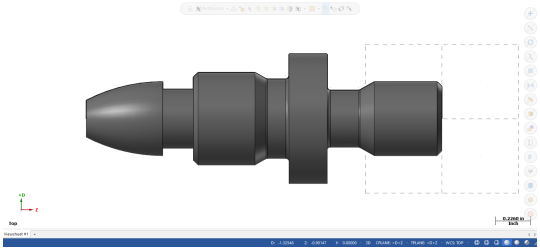
- Bulleted text are step by step instructions that need to be followed.

The files used in this book are available for download at http://www.emastercam.com/files/.

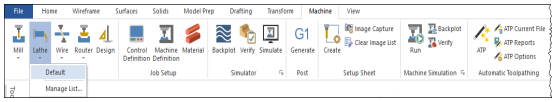
MASTERCAM® WORK FLOW

The process to create or import the geometry and to generate a toolpath will be repeated over and over through the tutorials in this book. You will find the process simple and straightforward once you have programmed a few parts. The following is an outline of the process used to create programs:

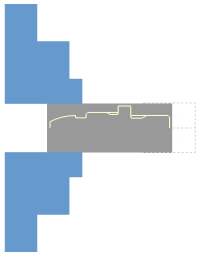
1. Create or import the part geometry.



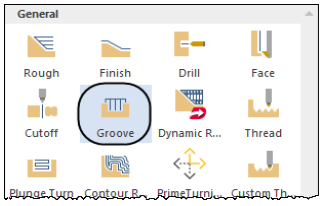
2. Select the Machine type.



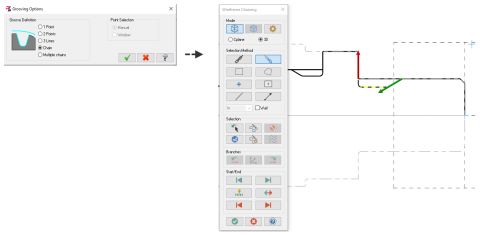
3. Define the stock size that your part will be cut from and set tool information.



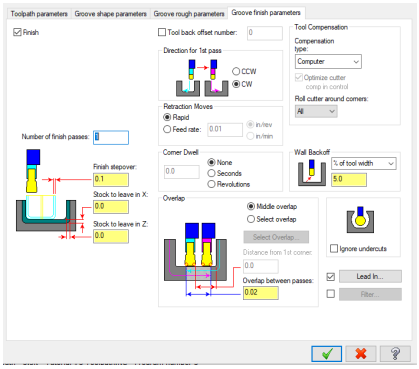
4. Select a toolpath type such as Groove.



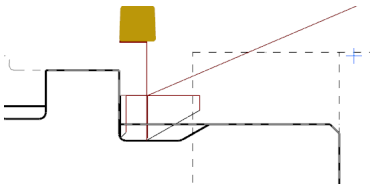
5. Select the geometry of the part you will cut with the different selection options.



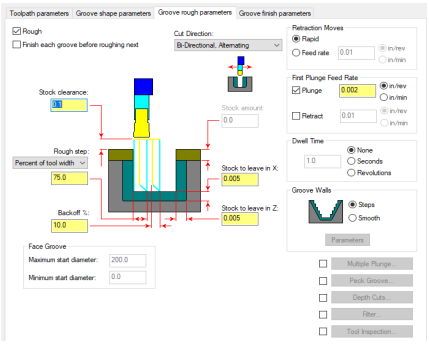
6. Fill in the necessary information on the parameters pages that appears for the toolpath type you selected.



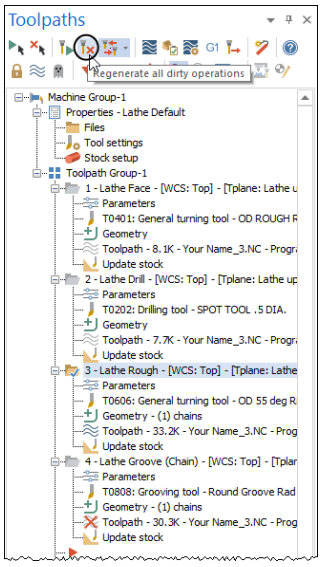
7. Verify the toolpath on your computer screen to confirm the results are as you expected, using Backplot and/or Solid Verify.



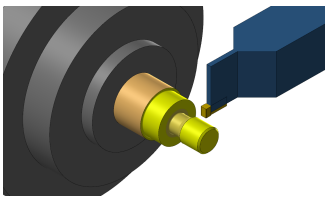
8. Make any changes as required by changing parameters.



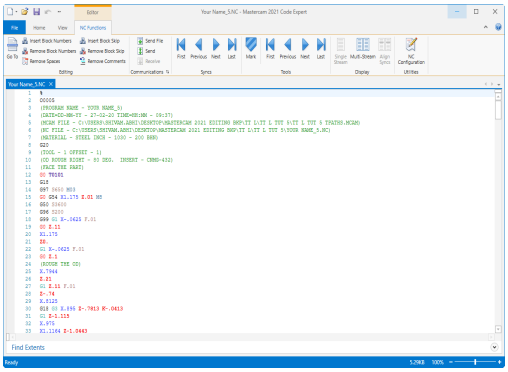
9. Regenerate the “Dirty” operation to update the parameter changes.



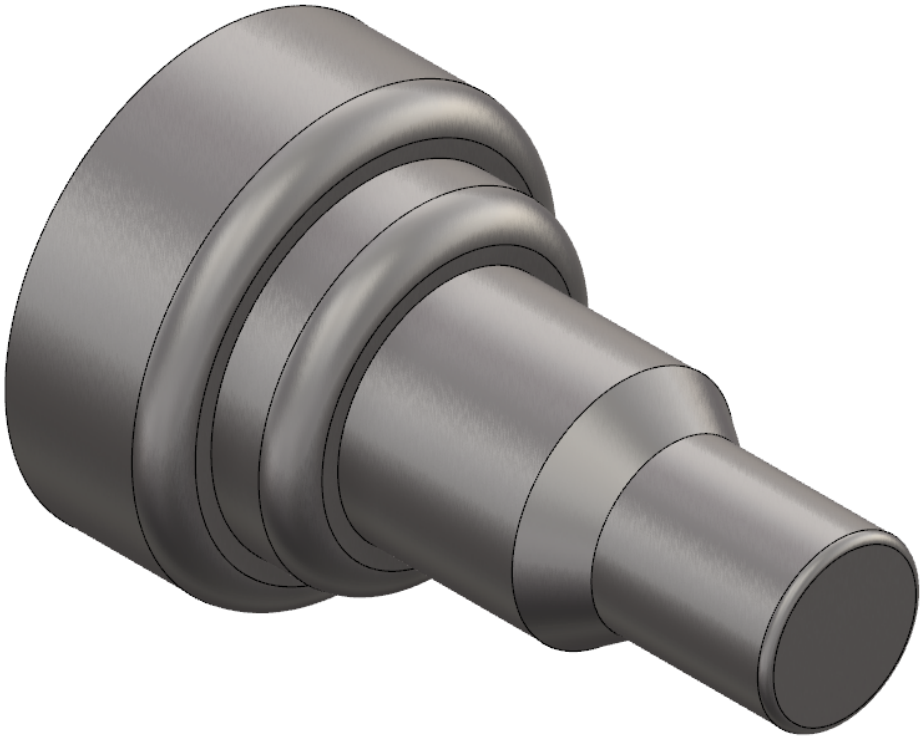
10. Verify again to make sure the toolpath is correct.



11. Convert the graphical toolpath information into machine code by Post Processing and sending it to the CNC machine.



Tutorial 1:
Geometry Creation



OVERVIEW OF STEPS TAKEN TO CREATE THE PART GEOMETRY

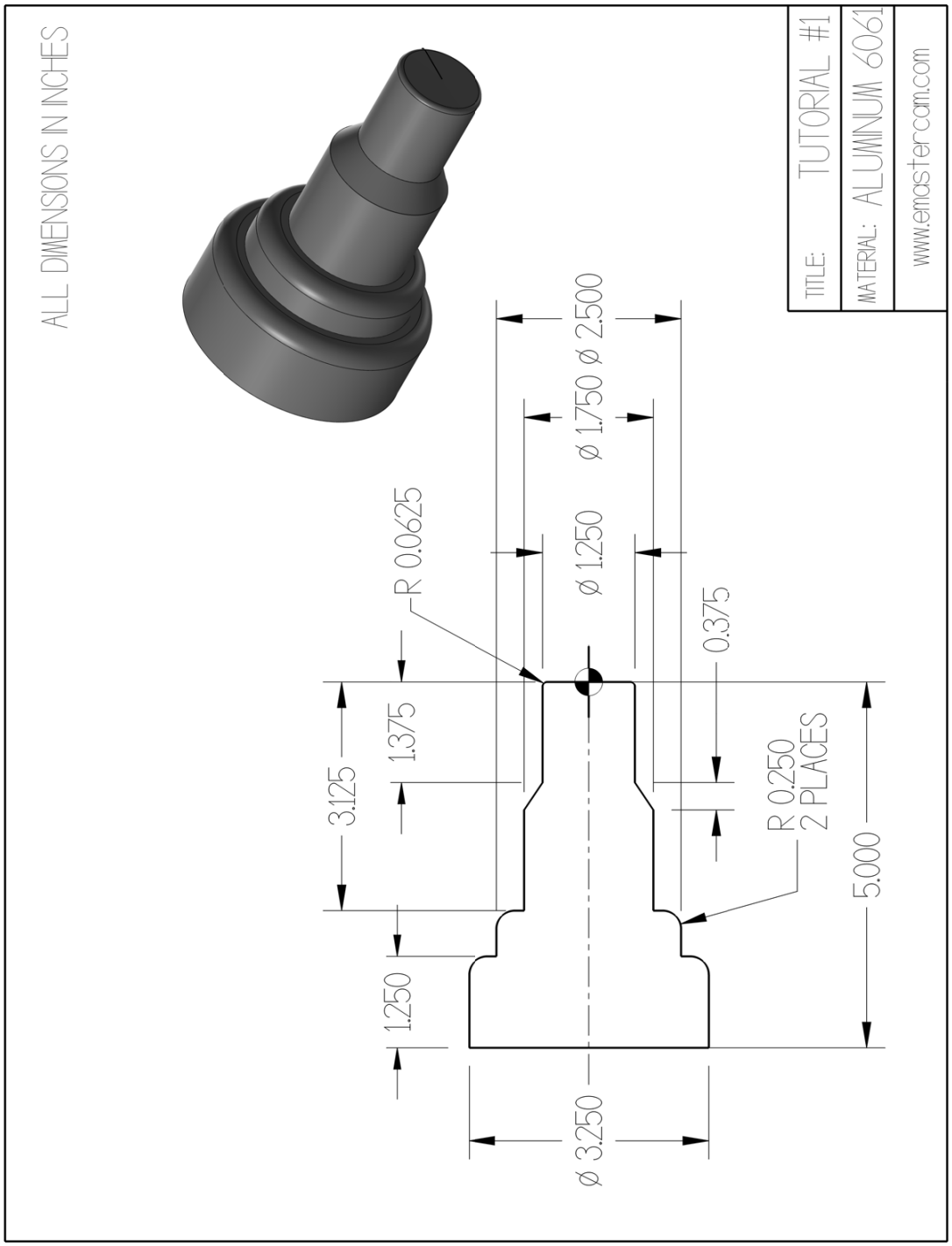
From Drawing to CAD Model:

- The student should examine the drawing on the following page to understand what part is being created in the tutorial.
- From the drawing we can decide how to create the geometry in Mastercam.

Create the 2D CAD Model:

- The student will create the upper profile of the part. Only half of the geometry is needed to create the necessary toolpaths to machine the part.
- Geometry creation commands such as Rectangle, Line Parallel, Line Endpoints, Fillet Entities, Trim to Entities and Divide will be used.

TUTORIAL #1 DRAWING



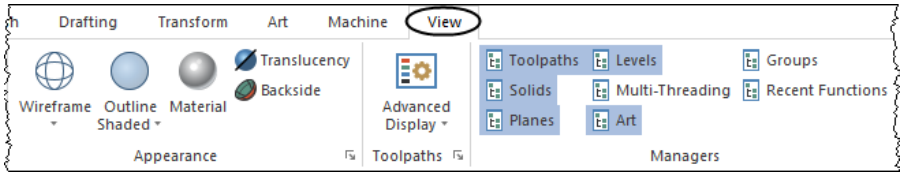
STEP 1: SETTING UP THE GRAPHICAL USER INTERFACE

Please refer to the **Getting Started** section for more info on how to set up the graphical user interface. In this step, you will learn how to hide the manager panels to gain more space in the graphics window.

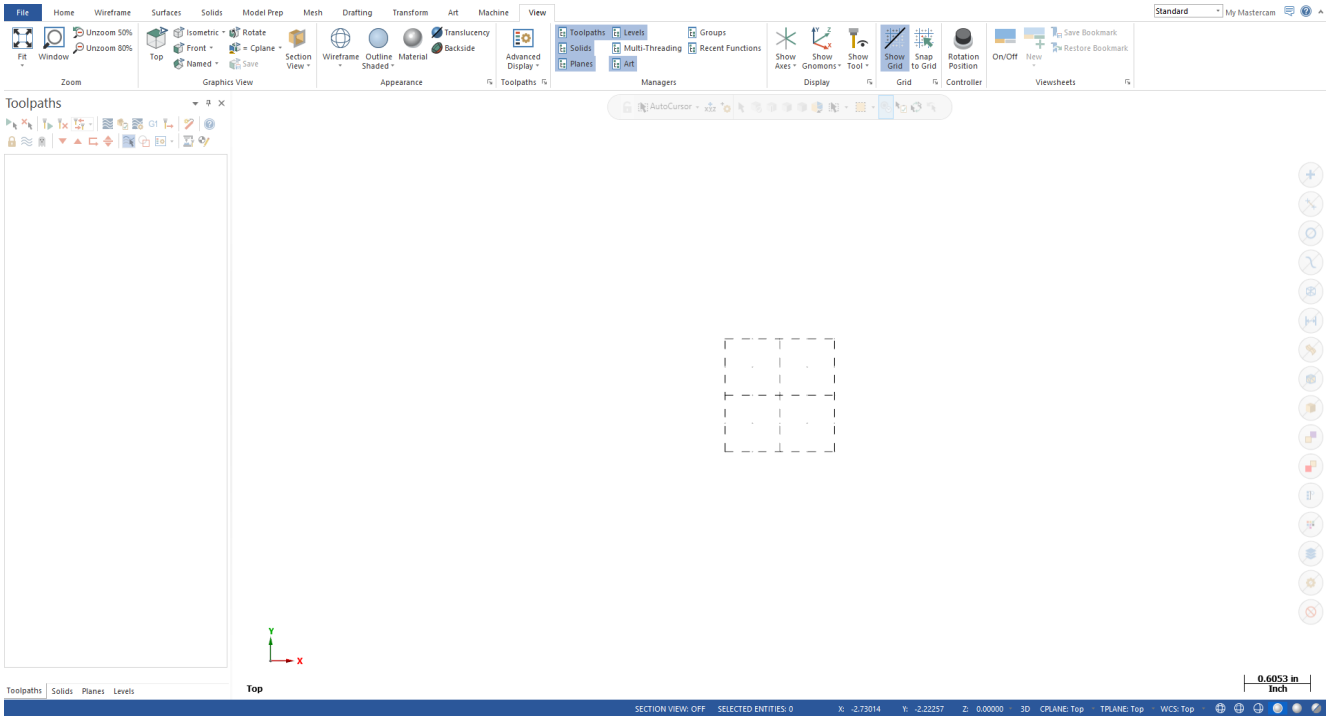
1.1 Hide the manager panels

View

- From the **Managers** group, enable all four managers as shown.

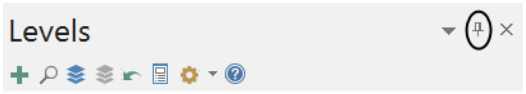


- The panels should be on the left side of the graphics window as shown.

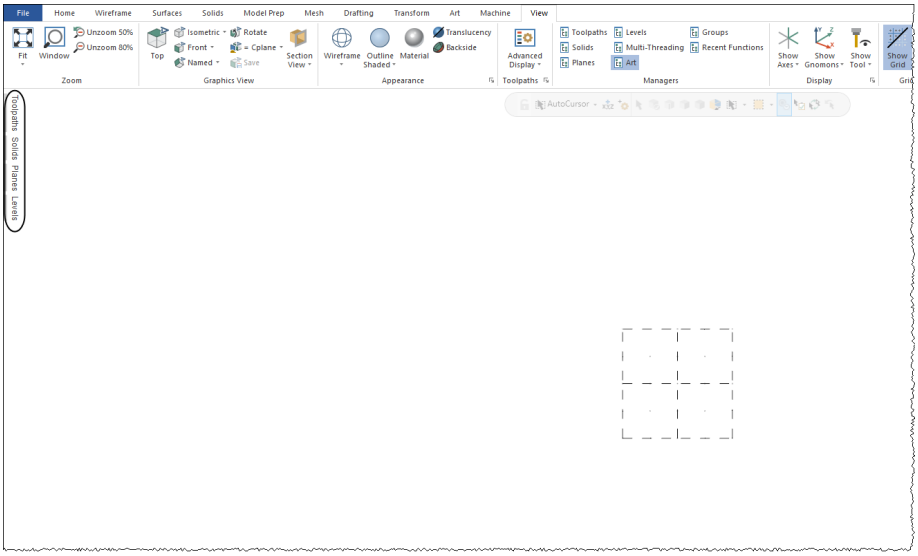


Note: It does not matter which panel is currently opened. It could be the **Toolpaths**, the **Solids**, the **Planes** or the **Levels** panel as shown.

- To hide all panels, click on the **Auto Hide** icon as shown.

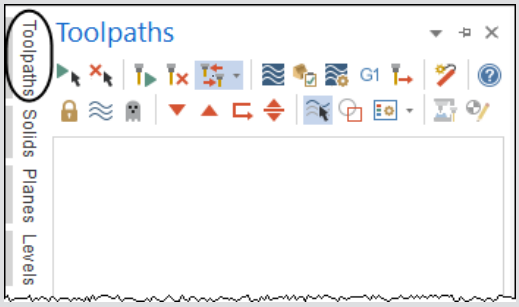


- The panels will be hidden to the left of the graphics window as shown.



Note: To un-hide them temporally, you can click on one of the **Managers** to open it as shown.

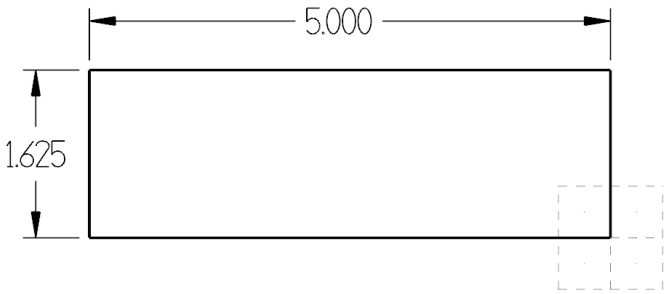
While creating the geometry, keep the **Manager** panels hidden. This ensures more space in the graphics window for the geometry.



STEP 2: CREATE A RECTANGLE

In this step you will learn how to create a rectangle given the width, the height, and the anchor position.

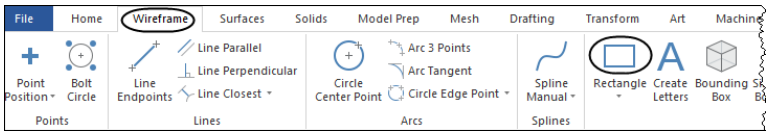
Step Preview:



2.1 Create the 5" by 1.625" rectangle

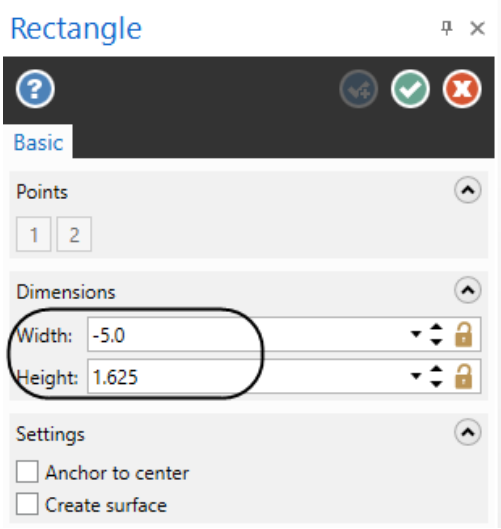
Wireframe

- From the **Shapes** group, select Rectangle.



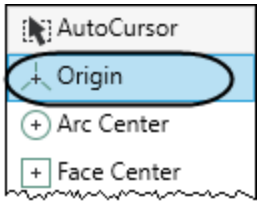
Note: Select the rectangle icon as shown. If you click too close to the drop down arrow, a fly-out list of commands appears and you can select the top Rectangle command.

- Enter the **Width** of **-5.0** and the **Height** of **1.625** and press Enter.



- To select the position of the base point, from the **General Selection** toolbar, click on the drop down arrow next to **AutoCursor** as shown.

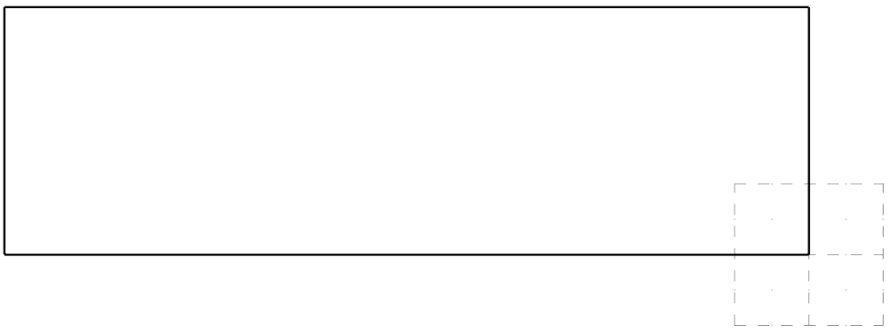
- From the fly-out menu select Origin.



- To see the entire rectangle, right mouse click in the graphics window and select **Fit** as shown.

Note: To fit the geometry to the screen you can also press **Alt + F1**.

- A preview of the geometry should look as shown.

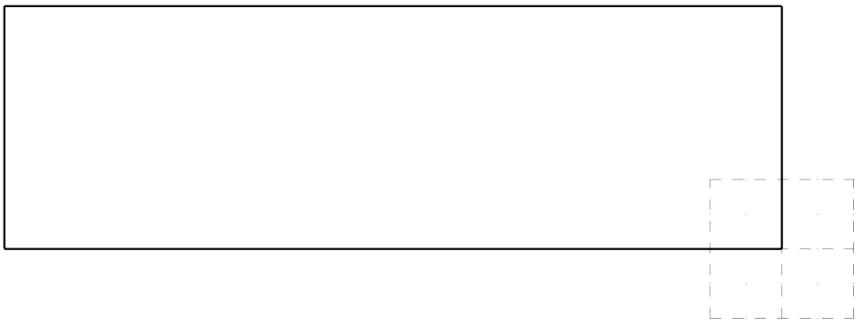


Note: The geometry should appear in a cyan blue color which is the color for live entities.

While the rectangle is live you can adjust the dimensions or select a new base point.

- Select the **OK** button to exit the **Rectangle** command. 

- The geometry should look as shown.



Note: While creating geometry for this tutorial, if you make a mistake, you can undo the last step using the **Undo** icon or by pressing **Ctrl + Z**. You can undo as many steps as needed. If you delete or undo a step by mistake, just use the **Redo** icon or press **Ctrl + Y**.

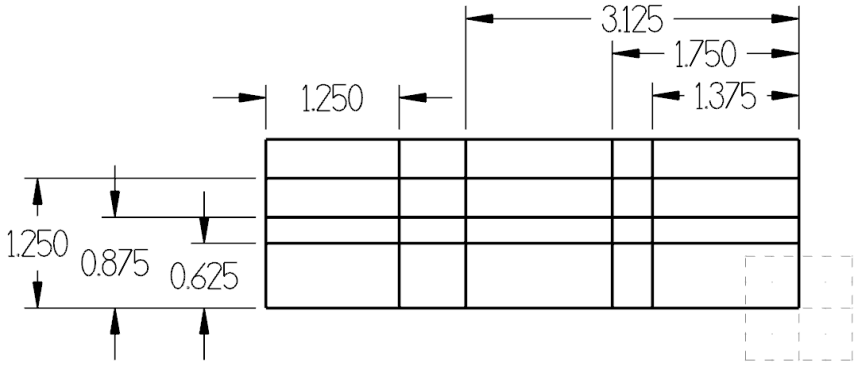
To delete unwanted geometry, select the geometry first and then press **Delete** from the keyboard.

To zoom tor unzoom, move the cursor to the center of the geometry and scroll up or down on the mouse wheel.

STEP 3: CREATE THE PARALLEL LINES

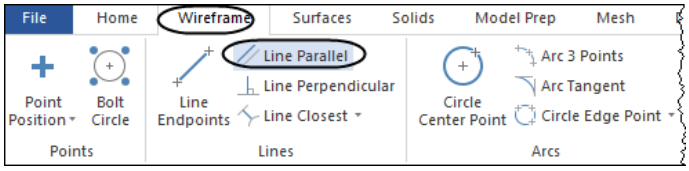
In this step you will learn how to create parallel lines to existing lines given the distance between the lines. We are creating the lines to use as part of the geometry as well as the construction lines.

Step Preview:

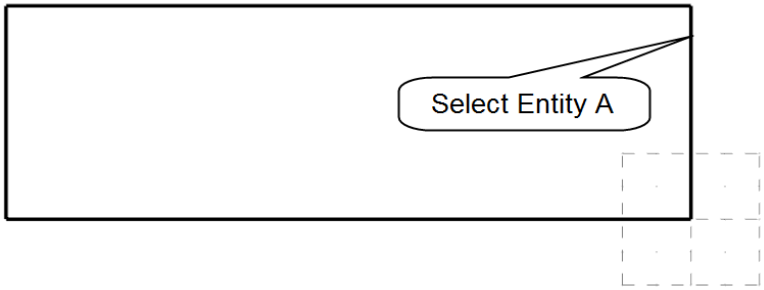


Wireframe

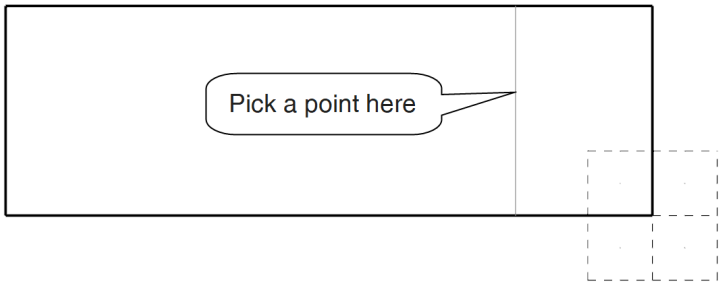
- From the **Lines** group, select **Line Parallel**.



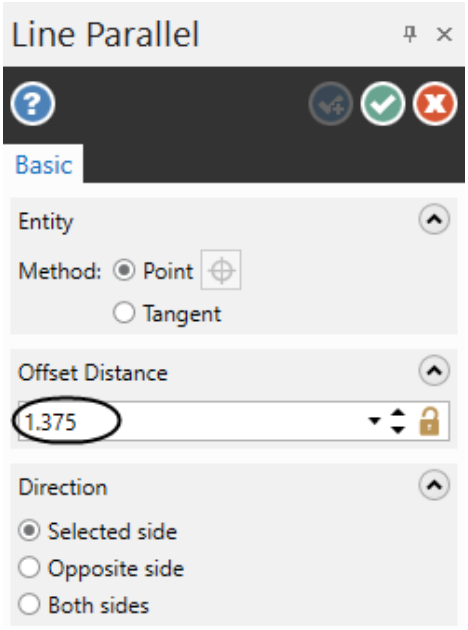
- [Select a line]: Select **Entity A** as shown.



- [Select the point to place a parallel line through]: Pick a point to the left of the selected line.



Note: The color of the geometry is cyan which means that the entity is "live" and you can still change the line parameters if needed.

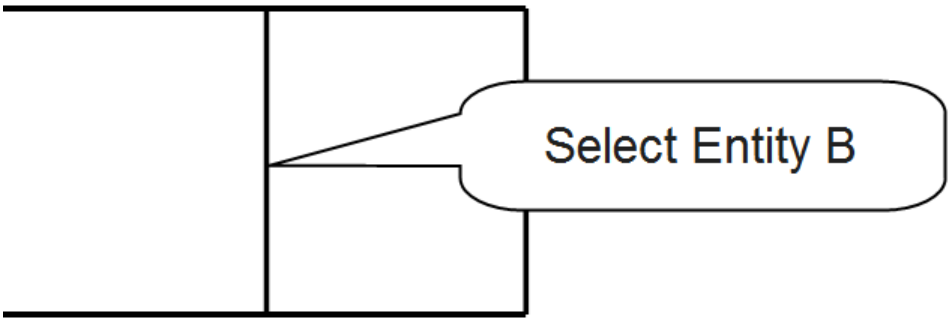


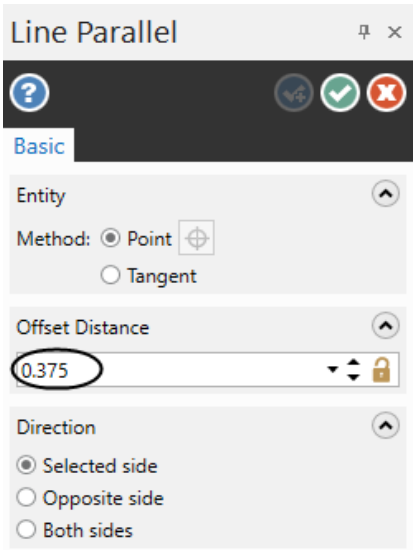
- In the **Line Parallel** panel, enter the **Distance 1.375**.
- Press **Enter** to move the line to the proper distance.

Note: To continue using the same command you can either select the **OK and Create New Operation** button  or press **Enter**. To exit the command you can either start a new command or select the **OK** button. 

- Press **Enter** to continue.

- [Select a line]: Select **Entity B** as shown.



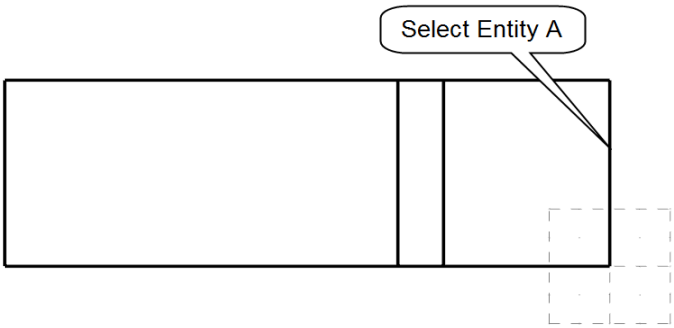


- [Select the point to place a parallel line through]: Pick a point to the left of the selected line.
- Enter the **Distance 0.375**.

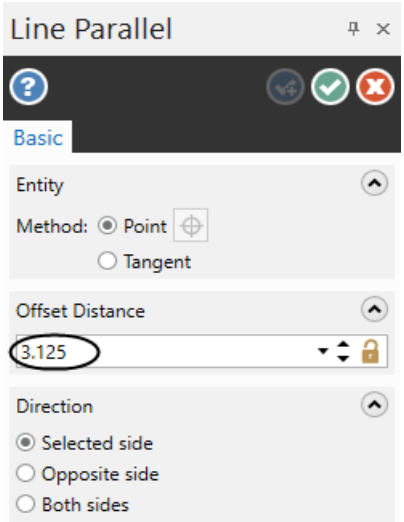
- Press **Enter** to move the line to the proper distance.

- Press **Enter** to continue or select the **OK and Create New Operation** button  .

- [Select a line]: Select **Entity A** again as shown.



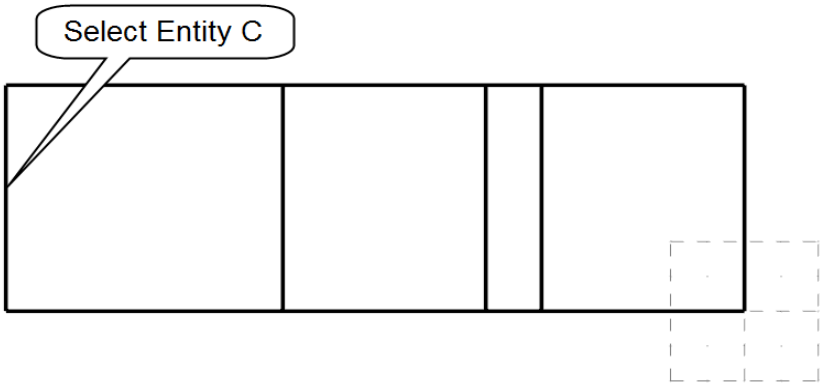
- [Select the point to place a parallel line through]: Pick a point to the left of the selected line.



- Enter the **Distance 3.125**.
- Press **Enter** to move the line to the proper distance.

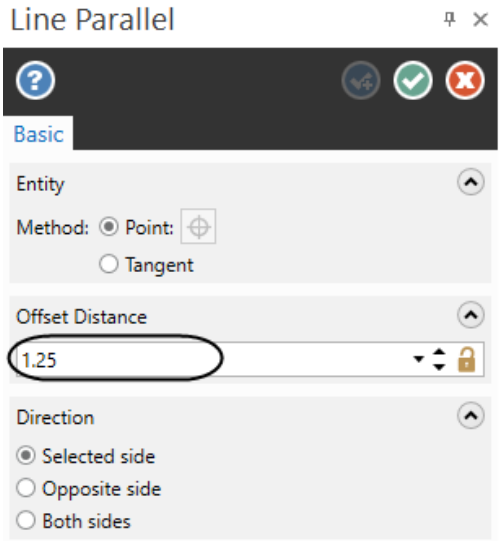
- Press **Enter** to continue or select the **OK and Create New Operation** button  .

- [Select a line]: Select **Entity C** as shown.



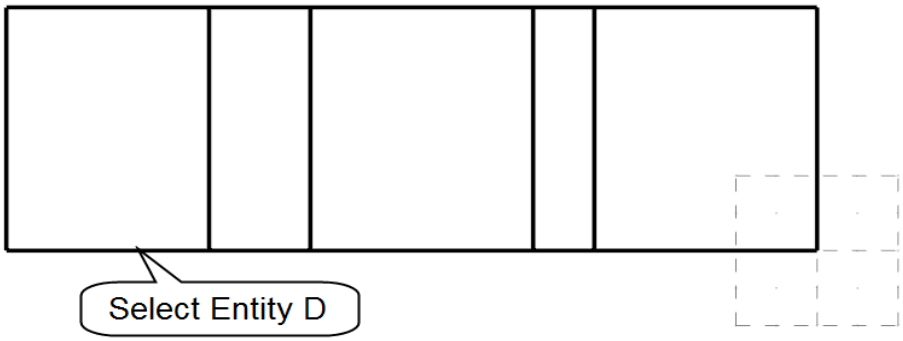
- [Select the point to place a parallel line through]: Pick a point to the right of the selected line.

- Enter the **Distance 1.25**.
- Press **Enter** to move the line to the proper distance.

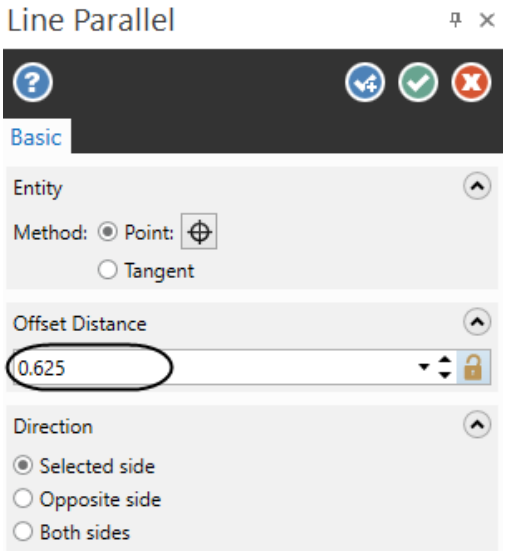


- Press **Enter** to continue or select the **OK and Create New Operation** button  .

- [Select a line]: Select **Entity D** as shown.

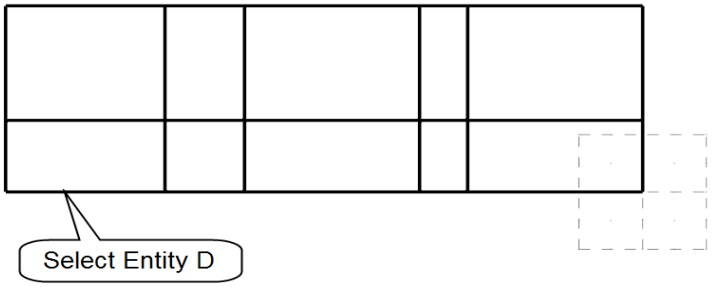


- [Select the point to place a parallel line through]: Pick a point above the selected line.

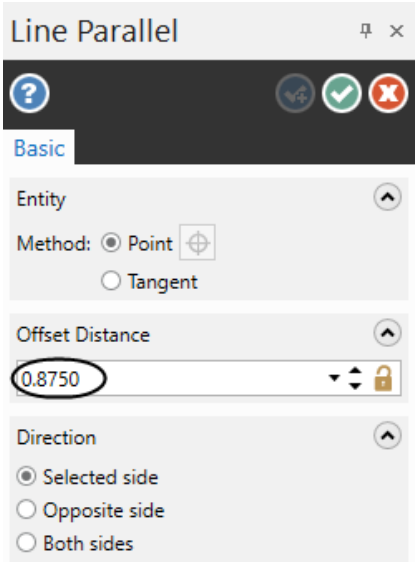


- Enter the **Distance 0.625**.
- Press **Enter** to move the line to the proper distance.
- Press **Enter** to continue or select the **OK and Create New Operation** button  .

- [Select a line]: Select **Entity D** again as shown.



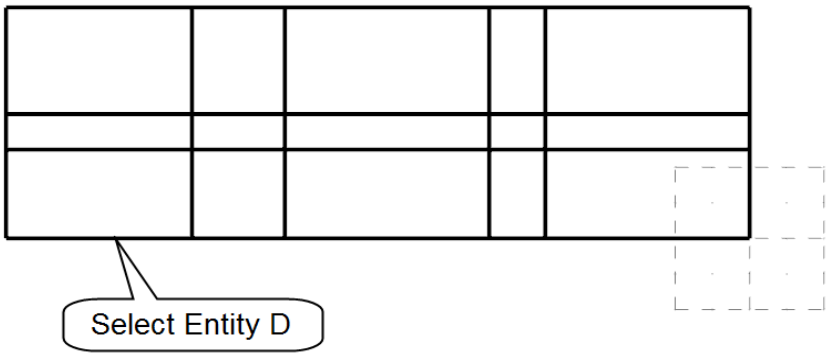
- [Select the point to place a parallel line through]: Pick a point above the selected line.



- Enter the **Distance 0.875.**

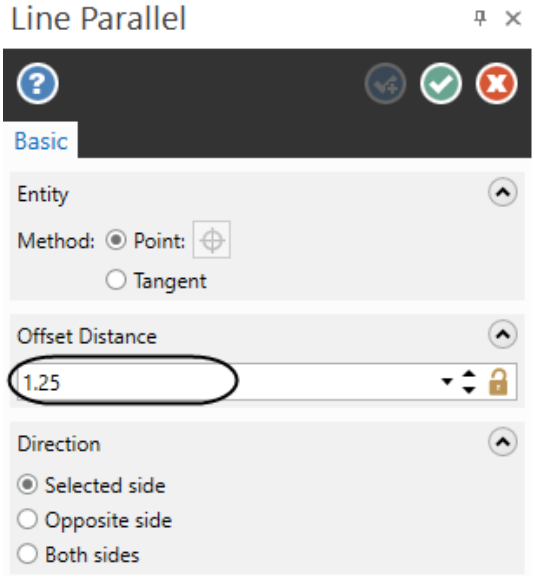
- Press **Enter** to move the line to the proper distance.
- Press **Enter** to continue or select the **OK and Create New Operation** button  .

- [Select a line]: Select **Entity D** again as shown.



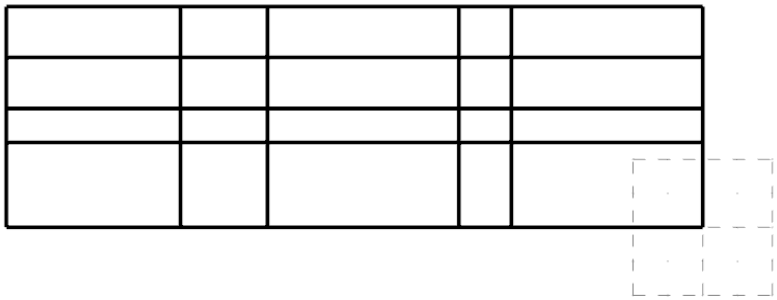
- [Select the point to place a parallel line through]: Pick a point above the selected line.

- Enter the **Distance 1.250**.



- Select the **OK** button to exit the command. 

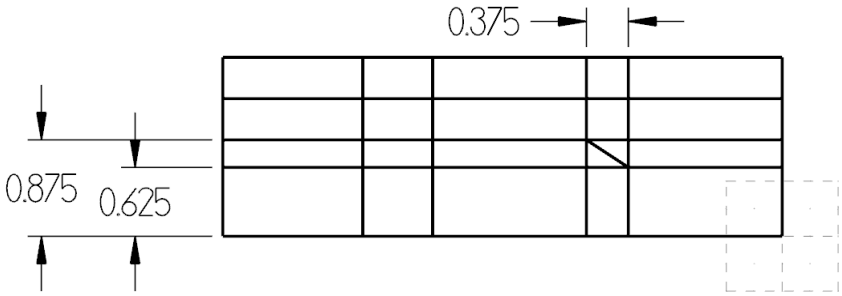
- The part should appear as shown.



STEP 4: CREATE LINE ENDPOINT

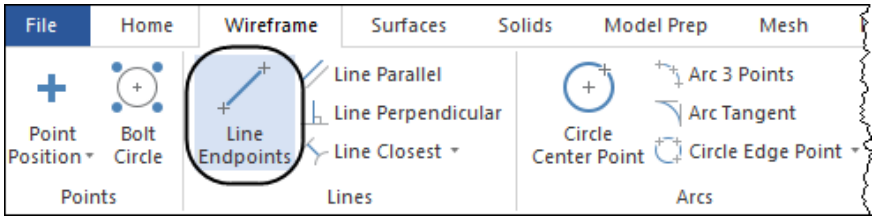
In this step you will use the line endpoints command to create a line connected to the intersection point of two construction lines.

Step Preview:

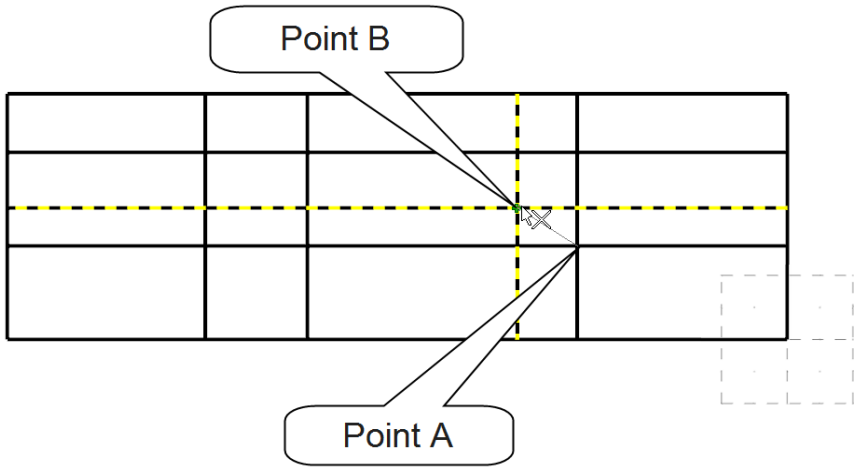


Wireframe

- From the **Lines** group, select **Line Endpoints**.



- [Specify the first endpoint]: Click the intersection between the two lines at **Point A** as shown.

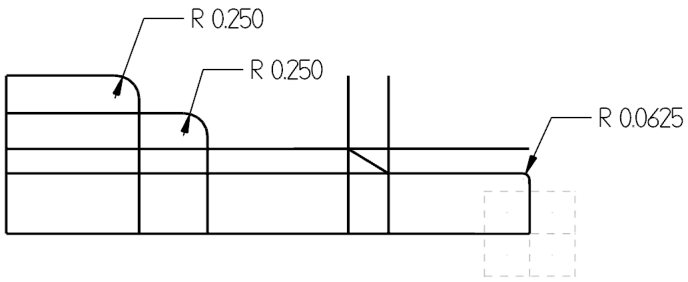


- [Specify the second endpoint]: Click the intersection between the two lines at **Point B** as shown.
- Select the **OK** button to exit the command.

STEP 5: CREATE THE FILLETS

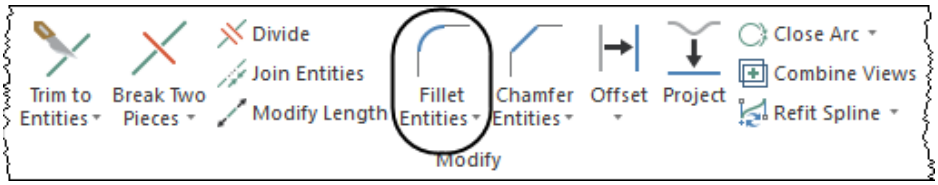
In this step we will use the create fillet command to simultaneously create a fillet and trim two entities.

Step Preview:

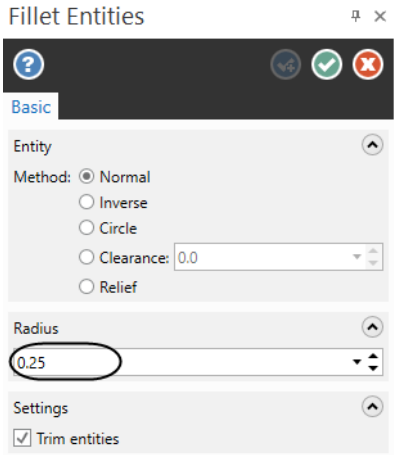


Wireframe

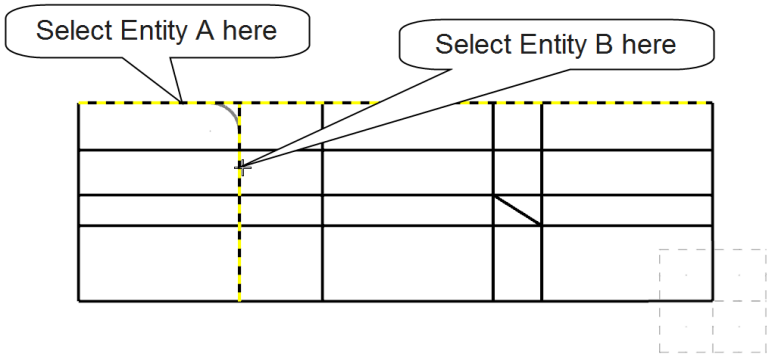
- From the **Modify** group, select **Fillet Entities.**



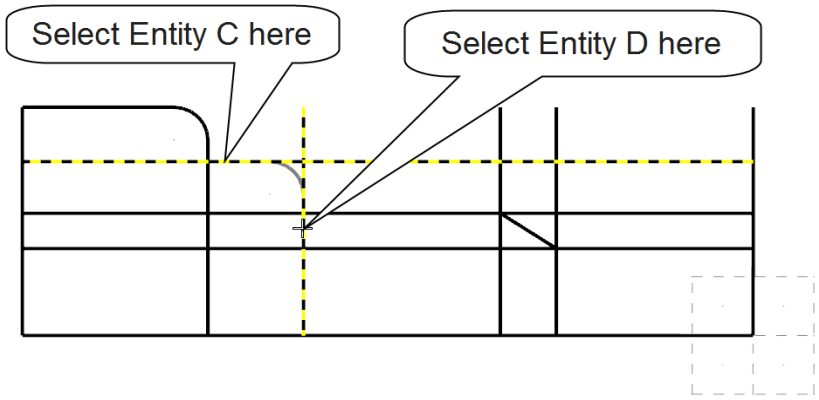
- In the **Fillet Entities** panel, enter the **Radius 0.25** and make sure that the rest of the parameters in the window are set as shown.



- [Select an entity]: Select **Entity A** as shown.
- [Select another entity]: Select **Entity B** as shown.

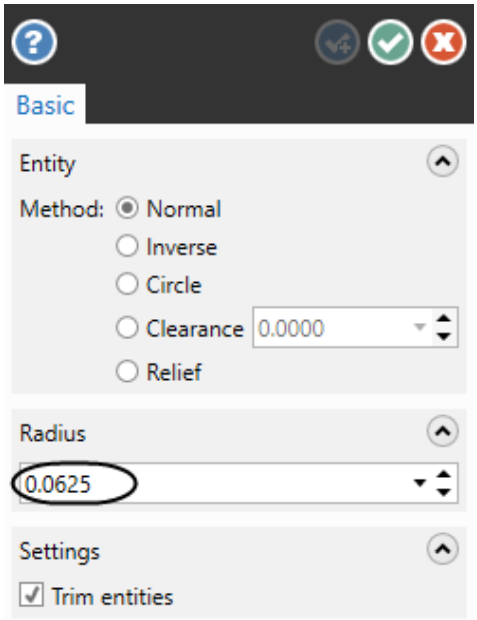


- [Select an entity]: Select **Entity C** as shown.
- [Select another entity]: Select **Entity D** as shown.

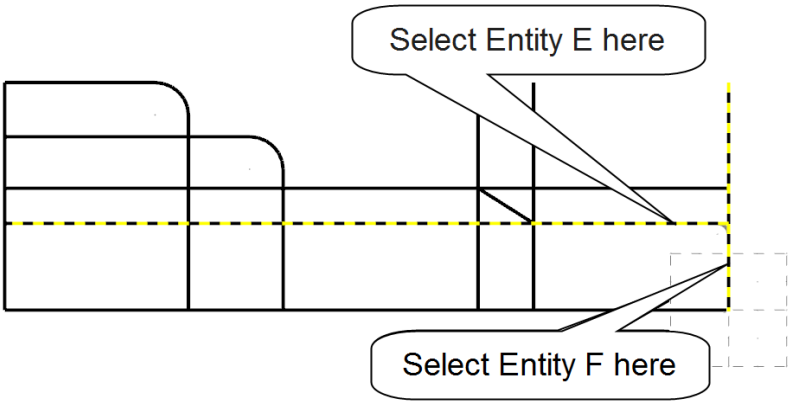


- Press **Enter** to finish the fillet.

- Change the **Radius** to **0.0625** and make sure that the rest of the parameters in the window are set as shown.



- [Select an entity]: Select **Entity E** as shown.
- [Select another entity]: Select **Entity F** as shown.

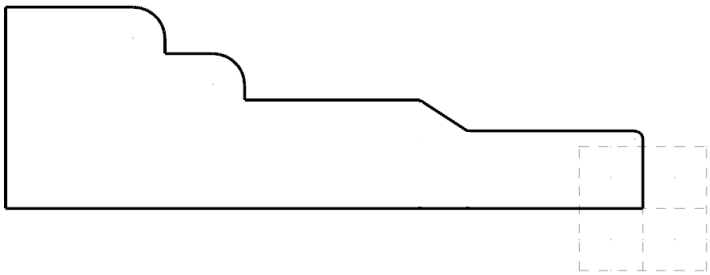


- Select the **OK** button to exit the command. 

STEP 6: TRIM THE GEOMETRY

This step shows you how to trim two entities using the **Trim to Entities** command. To trim two entities to their intersection, enable the **Trim 2 entities** button and click on the first entity that you want to trim or extend on the side that you want to keep after trimming and then click on the entity you want to trim or extend to. Always ensure that you select the entities on the side that you want to keep after trimming.

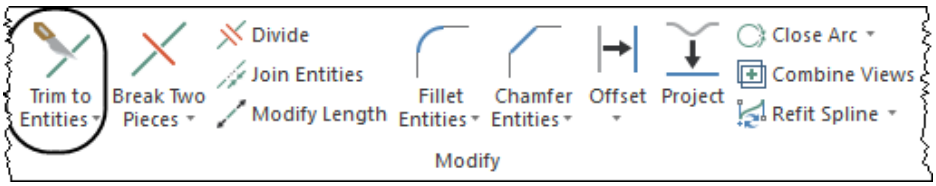
Step Preview:



6.1 Use the trim two entities command

Wireframe

- From the **Modify** group, select **Trim to Entities.**



- Enable the **Trim 2 entities** button.